Docket No. 303.229US2 Micron Ref. No. 96-0613.01
WD #224972.wpd

CLEAN VERSION OF PENDING CLAIMS

SILICON-GERMANIUM DEVICES FOR CMOS FORMED BY ION IMPLANTATION AND SOLID PHASE EPITAXIAL REGROWTH
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Serial No.: 09/132,157

Claims 11, 13, 14, 24-28,32 and 38-43 as of November 28, 2001 (Date of Response to Final Office Action after RCE).

11. (Six times amended) A p-channel metal-oxide-semiconductor transistor, comprising:

a silicon substrate;

a silicon dioxide (SiO_2) gate oxide, coupled to the substrate;

a gate, coupled to the SiO_2 gate oxide;

source/drain regions formed in the substrate on opposite sides of the gate; and

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction x, located underneath the SiO_2 gate oxide and between the source/drain regions, wherein x is less than or equal to 0.6, and wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide.

13. The transistor of claim 11, wherein the $Si_{1-x}Ge_x$ channel is approximately 100 to 1,000 angstroms thick.

14. The transistor of claim 11, wherein the molar fraction of germanium is approximately 0.2.

24. (Six times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of x, and formed in the substrate, underneath a silicon dioxide (SiO_2) gate oxide and between a source region and a drain region;

wherein x is less than or equal to 0.6, and wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide.

25. (Five times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of x, and formed in the substrate, underneath a silicon dioxide (SiO_2) gate oxide and between a source region and a drain region, wherein x is less than or equal to 0.6, and wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide; and

wherein the $Si_{1-x}Ge_x$ channel region is formed from ion implanting germanium (Ge) into the substrate at a dose of approximately 2×10^{16} atoms/cm^2, and wherein the Ge is implanted at an energy of approximately 20 to 100 keV.

26. The transistor of claim 24, wherein the Ge is dispersed in the substrate to a depth of approximately 100 to 1,000 angstroms.

27. The transistor of claim 24, wherein the Ge is dispersed in the substrate to a depth of approximately 300 angstroms.

28. (Six times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of 0.2, and formed in the substrate, underneath a silicon dioxide (SiO_2) gate oxide and between a source region and a drain region, wherein th $Si_{1-x}Ge_x$ channel region forms a continuous Si_{1-}

$_xGe_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide.

32. The transistor of claim 28, wherein the $Si_{1-x}Ge_x$ channel region was formed by a process comprising:

ion implanting Ge ions through the gate oxide on the substrate at a dose of approximately 2 X 10^{16} atoms/cm^2, and wherein the Ge was implanted at an energy of approximately 20 to 100 keV; and

annealing the substrate in a furnace at a temperature of approximately 450 to 700 degrees Celsius.

38. (Four times amended) A semiconductor transistor, comprising:

a silicon substrate;

a silicon dioxide (SiO_2) gate oxide, coupled to the substrate;

a gate, coupled to the SiO_2 gate oxide;

source/drain regions formed in the substrate on opposite sides of the gate; and

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of x, and located underneath the SiO_2 gate oxide and between the source/drain regions, wherein x is less than or equal to 0.6, and wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide.

39. The transistor of claim 38, wherein the $Si_{1-x}Ge_x$ channel is approximately 100 to 1,000 angstroms thick.

40. (Four times amended) A semiconductor transistor formed on a silicon substrate, comprising:

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a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of 0.2 formed in the substrate, underneath a silicon dioxide (SiO_2) gate oxide and between a source region and a drain region, wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide.

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41. (Thrice amended) A semiconductor transistor formed on a silicon substrate, comprising:

a $Si_{1-x}Ge_x$ channel region, having a germanium molar fraction of x, and formed in the substrate, underneath a silicon dioxide (SiO_2) gate oxide and between a source region and a drain region, wherein x is less than or equal to 0.6, and wherein the $Si_{1-x}Ge_x$ channel region forms a continuous $Si_{1-x}Ge_x/SiO_2$ gate oxide interface wherein no germanium oxide is present at the $Si_{1-x}Ge_x/SiO_2$ gate oxide interface as a result of ion implantation of germanium through the previously formed SiO_2 gate oxide; and

wherein the $Si_{1-x}Ge_x$ channel region is formed from ion implanting germanium (Ge) into the substrate at a dose of approximately 2×10^{16} atoms/cm^2, and wherein the Ge is implanted at an energy of approximately 20 to 100 keV.

43. The transistor of claim 41, wherein the Ge is dispersed in the substrate to a depth of approximately 300 angstroms and the germanium molar fraction is about 0.4.